Haixia Du

CONTACT INFORMATION

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OBJECTIVE

Faculty or research position in computer graphics, visualization, or medical image processing related areas

SUMMARY OF QUALIFICATIONS

- Extensive knowledge and proven research expertise in the fields of computer graphics and visualization related areas.
- An excellent academic record, demonstrated ability to conduct independent research, to collaborate, as well as to lead research teams.
- Extensive experience in C/C++, OpenGL, and ITK. Experience in developing software systems with solid performance.

RESEARCH INTERESTS

Computer Graphics, Visualization, Geometric and Physics-Based Modeling, Medical Image Processing, Virtual Reality, Computer Animation and Simulation

EDUCATION

Ph.D. in Computer Science May 2004
Stony Brook University (State University of New York at Stony Brook)
Dissertation: PDE-based Geometric Modeling and Interactive Sculpting for Graphics
Advisor: Professor Hong Qin

M.S. in Computer Science May 2000
Stony Brook University (State University of New York at Stony Brook)

M.E. in Computer Science July 1998
Institute of Mathematics, Chinese Academy of Sciences
Thesis: Camera Planning for Automatic Generation of Computer Animation
Advisor: Professor Ruqian Lu

B.S. in Computer Science July 1995
Jilin University, Changchun, China

RESEARCH EXPERIENCE

Postdoctoral Fellow July 2004 - present
Office of High Performance Computing and Communications, Lister Hill National Center for Biomedical Communications, National Library of Medicine, National Institutes of Health

- **Image filtering and registration using ITK**
  - Developing image filters and registration algorithms based on differential and statistical information of medical images.
- **Data-driven implicit surface modeling using PDEs**
  - Applying PDEs for implicit model reconstruction from scattered data points.
  - Developing a shape modeling system for data reconstruction, shape morphing and transformation, medial axis extraction, and manipulation of implicit objects.
- **Non-photorealistic artistic rendering**
  - Participating in the open-source non-photorealistic artistic rendering project PLAWARe (programmable layered architecture with artistic rendering).
- **Information visualization for online medical paper archives**
  - Developing an information visualization system to visualize the structure of Medical Subject Headings (MeSH) and related indexing information of online medical paper archives.

Research Assistant June 1999 - May 2004
Center for Visual Computing, Computer Science Department, Stony Brook University

- **Dissertation: PDE-based Geometric Modeling and Interactive Sculpting for Graphics**
  - Developed a unified PDE-based modeling system of shape design, reconstruction, simplification, and manipulation for geometric objects of various data formats.
- **Shape skeletonization and manipulation**
  - Proposed diffusion equations for medial axis/skeleton extraction.
  - Applied diffusion-based front propagation for skeleton-based shape modeling.

- **Implicit PDE-based geometric design**
  - Applied implicit PDEs for shape design from sketches, damage data recovery, shape blending, model reconstruction from scattered points.
  - Developed a direct shape sculpting system for implicit objects.
- **PDE-based free-form modeling and deformation**
  - Proposed parametric PDEs for free-form modeling and deformation of solid objects.
  - Provided physics-based direct solid object manipulation and free-form deformation.
- **Direct manipulation of physics-based PDE surfaces and displacements**
  - Applied elliptic PDEs for parametric surface design and manipulation.
  - Developed interactive and direct manipulation toolkits for realistic PDE surface sculpting with physical properties and material attributes.

Research Assistant February 1995 - July 1998

Institute of Mathematics, Chinese Academy of Sciences

- **Thesis: Camera Planning in Automatic Generation of Computer Animation**
  - Designed a software layer that can automatically plan cameras movements including starting positions and moving directions in Computer Animation Auto-Generation.
  - This work contributed to Chapter 8: Camera Planning, in *Automatic Generation of Computer Animation: Using AI for Movie Animation* by Ruqian Lu and Songmao Zhang, P255-283, published by Springer-Verlag, 2002.
- **Automatic Generation of Multimedia ICAI Systems**
  - This project was to provide an interactive software environment that can generate Intelligent Computer-Aided Instruction (ICAI) systems automatically. I developed the user interface for the system.
- **Automatic Generation of Computer Animation**
  - We developed a software system that automatically generated children's cartoons from a story written using a limited Chinese natural language. I designed a software layer that can automatically plan cameras movements including starting positions and moving directions. I also designed a collision detection algorithm for scene layouts. The broader goal of this project was to apply Artificial Intelligence techniques to automate the animation process and reduce the production cost.

PUBLICATIONS

Journal Papers

1. **H. Du,** H. Qin, Free-Form Solid Modeling by Integrating Parametric and Implicit PDEs, accepted by IEEE Transactions on Visualization and Computer Graphics (TVCG), 2006
2. **H. Du**, H. Qin, A Shape Design System Using Volumetric Implicit PDEs, *Computer Aided Design*, Vol. 36, No.11, pages 1101-1116, 2004
3. **H. Du**, H. Qin, Dynamic PDE Surface Design Using Geometric and Physical Constraints**,** *Graphical Models*, Vol.67, No.1, pages 43-71, 2005

Conference / Workshop Papers

4. **H. Du**, H. Qin, Medial Axis Extraction and Shape Manipulation of Solid Objects Using Parabolic PDEs**,** *The Ninth ACM Symposium on Solid Modeling and Applications*, 06/09-06/11, 2004, Genova, Italy
5. **H. Du**, H. Qin, Shape Design, Reconstruction, and Manipulation Using Volumetric Implicit PDEs*, SIAM Conference on Geometric Design and Computing*, 11/10 –11/13, 2003, Seattle, WA
6. **H. Du**, H. Qin, Interactive Shape Design Using Volumetric Implicit PDEs, *The Eighth ACM Symposium on Solid Modeling and Applications*, 06/16- 06/20, 2003, University of Washington, Seattle, WA
7. **H. Du**, H. Qin, Physics-based PDE Solids with Global and Local Constraints for Geometric Design, *SIAM Conference on Geometric Design and Computing*, 11/05 – 11/08, 2001, Sacramento, CA
8. **H. Du**, H. Qin, Integrating Physics-based Modeling with PDE Solids for Geometric Design, *Pacific Graphics 2001*, 10/16 – 10/18, 2001, Tokyo, Japan
9. **H. Du**, H. Qin, Dynamic PDE Surfaces with Flexible and General Geometric Constraints, *Pacific Graphics 2000*, 10/03 – 10/05, 2000, Hong Kong, P.R. China
10. **H. Du**, H. Qin, Interactive Sculpting and Direct Manipulation on PDE Surfaces, *Eurographics 2000*, 08/21 – 08/25, 2000, Interlaken, Switzerland
11. W. Chen, R. Lu, W. Zhang, and **H. Du**, A Tool for Automatic Generation of Multimedia ICAI Systems, *International Conference on Artificial Intelligence in Education (AIED'97)*, 08/1997, Kobe, Japan

Courses

12. **H. Du**, H. Qin, A Shape Design System Using Volumetric Implicit PDEs, in "Modern Techniques in Implicit Modeling", ACM SIGGRAPH 2005 Course Notes #13, J. F. O'Brien, T. S. Yoo, M. Alexa, H. Du, and J. C. Hart Lecturers, Los Angeles, 2005

Technical Reports

13. H. Du, PDE Techniques for Computer Graphics and Visualization – A Survey, submitted for journal review, 2006
14. **H. Du**, H. Qin, PDE-based Skeletonization and Propagation for Arbitrary Topological Shapes, in preparation for journal submission, 2006
15. H. Du, PDE-based Geometric Modeling and Interactive Sculpting for Graphics, Ph.D. Thesis Proposal, Computer Science Department, Stony Brook University, 05/2003
16. H. Du, Partial Differential Equations for Computer Graphics, Ph.D. Research Proficiency Examination, Computer Science Department, Stony Brook University, 06/2001

Book Material

My work in the project "Automatic Generation of Computer Animation" appeared as part of the book: R. Lu and S. Zhang, Automatic generation of computer animation, Springer-Verlag, January 2002.

PROFESSIONAL PRESENTATIONS

1. PDE-based Techniques for Geometric Modeling and Medical Imaging, Invited talk, Academy of Mathematics and Systems Science, Chinese Academy of Sciences, Beijing, China, 09/08, 2006
2. An Implicit Shape Analysis Framework Based on Differential Properties, Research progress report, Lister Hill Center, National Library of Medicine, 09/27, 2005
3. Implicit Modeling with PDE-based Techniques, Course presentation, SIGGRAPH 2005, Los Angeles, CA, 07/31, 2005
4. PDE-based Geometric Modeling and Interactive Sculpting for Graphics, Dissertation defense, Computer Science Department, Stony Brook University, 03/12, 2004
5. Interactive Shape Design Using Volumetric Implicit PDEs, The Eighth ACM Symposium on Solid Modeling and Applications, University of Washington, Seattle, WA, 06/20, 2003
6. PDE-based Geometric Modeling and Interactive Sculpting for Graphics, Thesis Proposal Presentation, Computer Science Department, Stony Brook University, 05/02, 2003
7. Partial Differential Equations for Computer Graphics, Research Proficiency Examination, Computer Science Department, Stony Brook University, 06/04, 2001
8. Interactive Sculpting and Direct Manipulation on PDE Surfaces, Eurographics 2000, Interlaken, Switzerland, 08/24, 2000
9. Direct Manipulation and Interactive Sculpting of PDE Surfaces, Graduate Research Conference 2000, Computer Science Department, Stony Brook University, 03/31, 2000

TEACHING EXPERIENCE

- Seminar Coordinator for CSE 665 Seminar on Geometric Modeling and Physical Simulation, 01/2000 – 08/2000
- Teaching Assistant for CSE 315 Theory of Database, 01/1999 – 05/1999
- Teaching Assistant for CSE 304/504 Compiler Design, 09/1998 – 12/1998

REVIEWER

Journals

IEEE Transactions on Visualization and Computer Graphics (TVCG), ACM Transactions on Applied Perception, The Visual Computer, Chinese Journal of Software

Conferences / Workshops

SIGGRAPH, Visualization, Eurographics, Solid Modeling, Dagstuhl Conference on Geometric Design

CAMPUS ACTIVITIES

- **Graduate Student Organization (GSO) Senator**, Stony Brook University, 04/2000-05/2001
- **Member of Computer Science Graduate Student Council (CSGSC)**, Computer Science Department, Stony Brook University, 09/1999-09/2000